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IGES
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Mapping the current landscape of biodiversity and ecosystem services valuation tools for business

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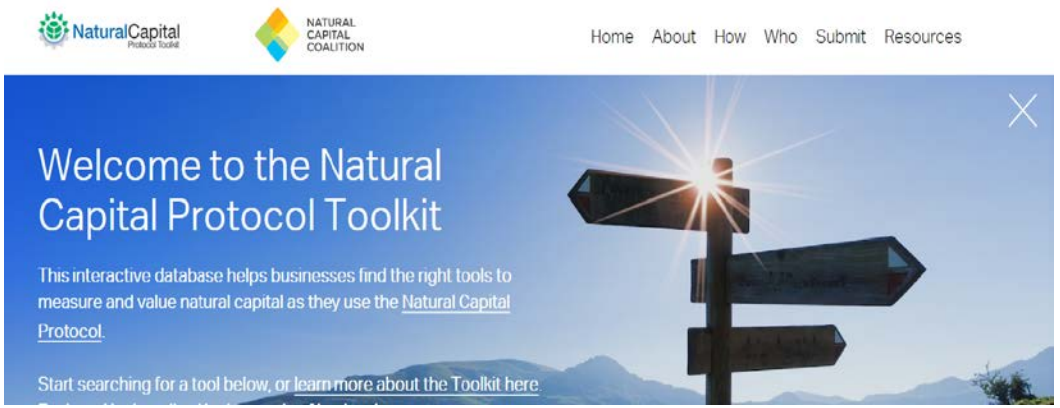
Background (1)

- Considering multi-dimensional aspects of biodiversity and ecosystem services (BES), **collaboration with private sector** and natural resource users in conservation and management of BES is critical.
- **Various tools are available for business** to identify their dependency and impacts on BES, and understand their associated risks.
- The **Natural Capital Protocol Toolkit** is an interactive database of tools to help businesses valuate BES and integrate them into their decision-making.



Background (2)

- The Kering launched the report on Corporate Environmental Profit and Loss account, which introduced **monetary valuation of natural capital including supply chain**, compared changes of impact on natural capital by each year, and clarified priority issues to work on. (2013)
- **Natural Capital Protocol**, which introduce a framework to generate natural capital valuation related information for business were developed by Natural Capital Coalition together with international institutions (2016), and introduced **toolkit** to implement the Protocol (2017)

In Japan

- ✓ Developing **economic valuation methodology for biodiversity conservation activities** for company by the Ministry of the Environment, Japan (MOEJ)
- ✓ Working on **national level of accounting based on SEEA EEA framework** as a research project supported by MOEJ

Definition of Natural Capital

Natural capital is another term for the stock of renewable and non-renewable natural resources on earth (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits or "services" to people (adapted from Atkinson and Pearce 1995; Jansson et al. 1994).

Figure: Natural capital stocks, flows and value

Source: Natural Capital Protocol 2016: 12

Purpose

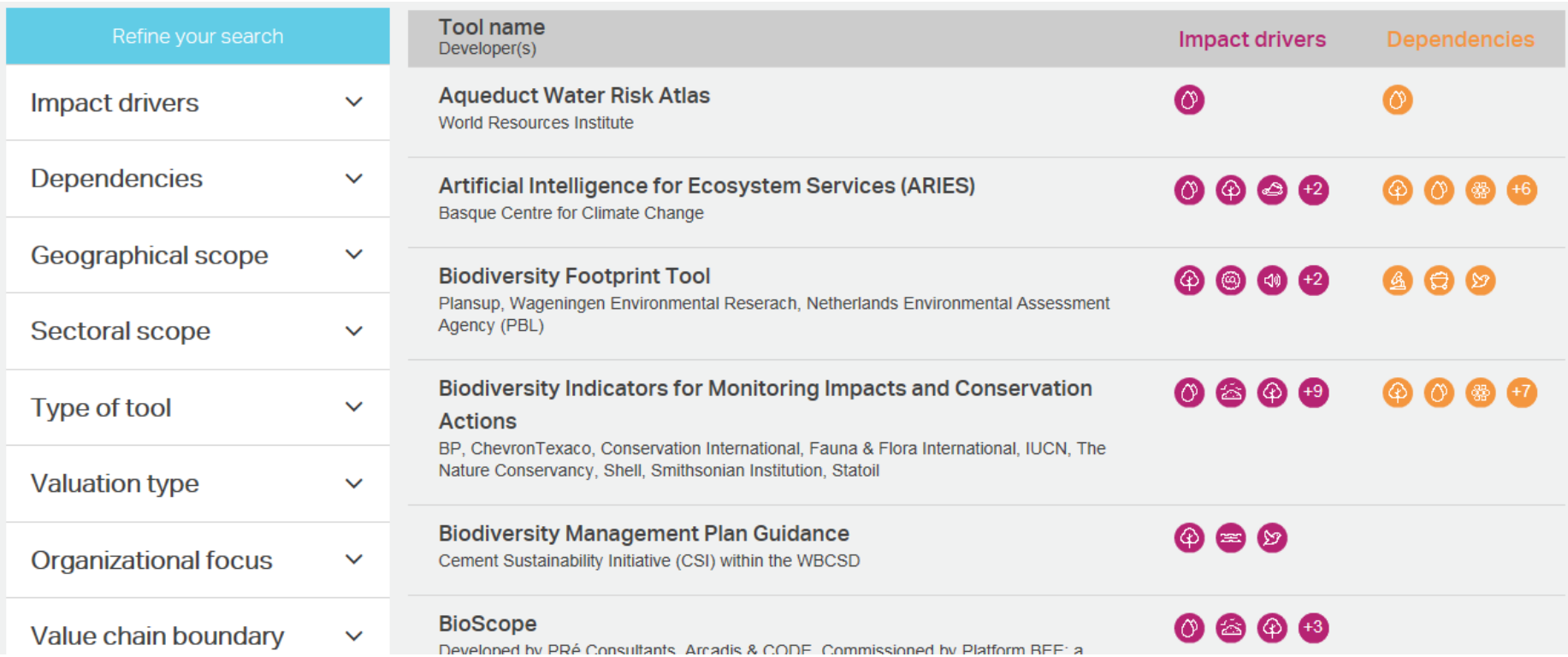
Through a review of various tools available for business,

- ☐ the paper mapped:
  - **Key impact drivers** they used in the valuation tools;
  - **Key features of the tools** with a view of comprehensiveness, universality, simplicity and accessibility; and
  - Indicators that tools used for **land use valuation**
- ☐ The paper also identified
  - the tools fit into **the interests of the Japanese companies**
  - **gaps in the existing valuation tools** and discussed **what need to be done** to fill these gaps.

Methodology (1)

Out of all 57 tools available on the Natural Capital Protocol Toolkit, launched in July 2017, the paper analyze 39 tools, which is suitable for valuation of biodiversity and ecosystem services (As of August 31, 2017）

Natural capital Protocol Toolkit



https://www.naturalcapitaltoolkit.org/

Methodology (2)

- **Identified which key impact drivers** (out of 12 key impact drivers namely 1) land use, 2) freshwater ecosystem use, 3) impacts on biodiversity, 4) water use, 5) water pollutants, 6) other natural resource use, 7) GHG emission, 8) soil pollutants, 9) marine ecosystem use, 10) air pollutants, 11) disturbance (noise/light), and 12) solid waste that the Natural Capital Protocol Toolkit identified) have been included in 39 tools,
- **Evaluated 39 existing tools in a view of comprehensiveness** (quantitative, covered several ES, corporate level, including supply chain), **universality** (all sectors & regions), **accessibility** (tools & data), **simplicity** (skills & time) and others
- **Reviewed more detail of the indicators for land use**, which has direct impact on biodiversity and ecosystem services

Analysis of existing valuation indicators and measures

Tools	Key impact drivers									
	Land use	Soil pollutants	Solid waste	Water use	Water pollutants	Air pollutants	GHG emissions	Energy consumption	Recreation	Positive impacts
E P&L (Kering/PwC 2015)	○		○	○	○	○	○			○
Natural Capital Protocol (NCC 2016)	○	○	○	○	○	○	○			○
Corporate Natural Capital Accounting (UK Natural Capital Committee 2015)	Both positive and negative impacts on Natural Capital (Ecosystem services and mineral etc.)									
	○	○		○	○	○	○		○	○
Life Certificate (Life Institute 2008)	○		○	○			○	○		○
...										
Priority areas	◎	–	–	○	–	–	–	–	○	◎

Impact indicators from land use: area, endanger spices, vegetation, condition of vegetation etc.

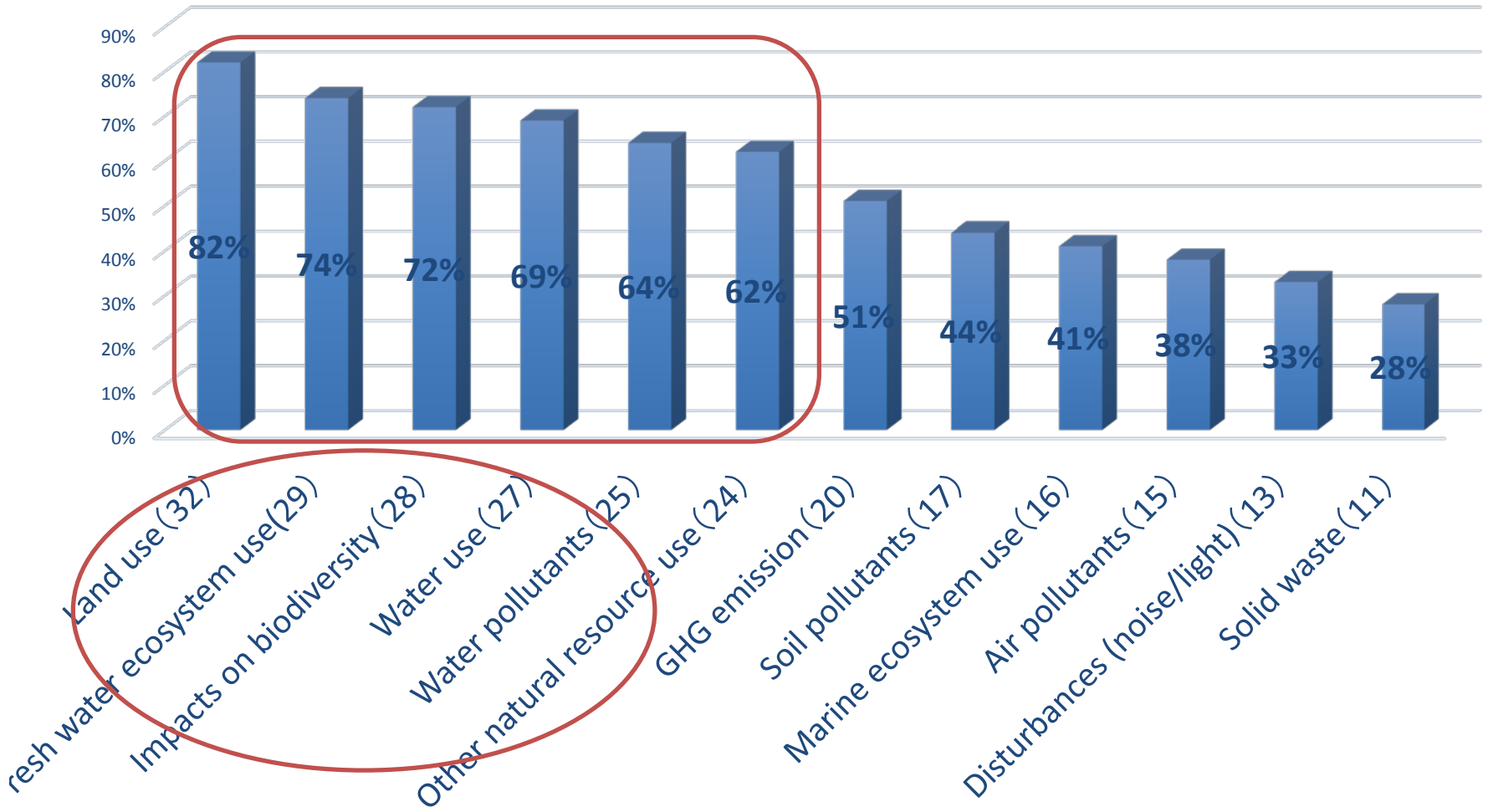
Evaluation criteria: comprehensiveness, universality, simplicity, data accessibility etc.

Challenges and benefits: evaluate existing indicators and methods

Identify relevant biodiversity valuation indicators and methods

Results (1)

Key impact drivers used for valuation tools (39) of biodiversity and ecosystem services



Results (2)

- **Identified the tools fit into the interests of Japanese companies**, **comprehensiveness** (quantitative, covered several ES, corporate level, including supply chain) and **universality** (all sectors & regions) out of 39 tools suitable for valuation of biodiversity and ecosystem services (As of August 31, 2017）→**12 tools**

1	Biodiversity Footprint Tool (Plansup, Wageningen Environmental Research, Netherlands Environmental Assessment Agency (PBL))	7	Environmental Prices (CE Delft on behalf of the Ministry of Environment, Stichting Stimular and Thermphos
2	Business guide to natural capital valuation (PwC)<Total Impact Measurement and Management (TIMM)>	8	ESII Tool (The Dow Chemical Company, The Nature Conservancy, EcoMetrix Solutions Group, LLC)
3	Co$tingNature (Costing Nature)(King's College London, AmbioTEK, UNEP-WCMC)	9	GaBi ts(thinkstep developed GaBi and the NCA integration is done in collaboration with trucost)
4	Corporate Environmental Profit and Loss account (EP&L)(Kering with the support of PwC)	10	Land Use Change Improved (LUCI)-LCA (Natural Capital Project and Unilever)
5	Corporate Guidelines for the Economic Valuation of Ecosystem Services (GVces - Center for Sustainability Studies of Getulio Vargas Foundation)	11	MiLCA (Japan Environmental Management Association for Industry)
6	Corporate Natural Capital Accounts (Natural Capital Committee, EFTEC, RSPB, PWC)	12	Solvay Sustainable Portfolio Management (SPM) tool (Solvay, Arthur D.Little and TNO)

Results (2)

The tools fit into the interests of Japanese companies

		Year	Valuation methods
1	Biodiversity Footprint Tool (Plansup, Wageningen Environmental Research, Netherlands Environmental Assessment Agency (PBL))	2017	Biodiversity evaluation based on global footprint of land use and GHG emission applying GLOBIO3 model (Changes of the Mean Species Abundance (MSA) by environmental impacts, trend of future scenario, identification of policy impacts)
2	Business guide to natural capital valuation (PwC)	2015	**Monetary valuation** of natural capital based on air pollution, GHG, land use, solid waste, water use, water quality
3	Co$tingNature (King's College London, AmbioTEK, UNEP-WCMC)	2009, (latest 2011)	use detailed spatial, global datasets at 1 km2 and 1 ha resolution, spatial biophysical and socioeconomic models, plus climate and land-use scenarios. **Monetary valuation** of changes of ecosystem services depends on policy options
4	Corporate Environmental Profit and Loss account (EP&L) (Kering with the support of PwC)	2016	**Monetary valuation** based on environmental impacts (GHG gas, water use, solid waste, water pollution, air pollution, and land use) throughout supply chain
5	Corporate Guidelines for the Economic Valuation of Ecosystem Services <Partnership with Brazilian Environmental Ministry >	2014	**Monetary valuation** focusing on ecosystem services which are easy to valuate for business: 1) water supply, 2) bio-fuel supply, 3) water quality regulation, 4) climate regulation, 5) pollination, 6) soil erosion control, 7) recreation/tourism etc.
6	Corporate Natural Capital Accounts (Natural Capital Committee, UK)	2015	**Natural capital accounts (Monetary valuation)** related to cost of restoration/management of nature and ecosystem service loss and creation based on land use of company

Results (2)

The tools fit into the interests of Japanese companies (con.)

		Year	Valuation methods
7	Environmental Prices (CE Delft on behalf of the Ministry of Environment, Stichting Stimular and Thermphos) <Dutch>	2010 (latest 2017)	**Monetary valuation.** Using a peer reviewed methodology with **lifecycle analysis**, a system has been developed that establishes the value prices for over 500 environmentally harmful substances including environmental impact (climate change, eutrophication, soil and water pollution, land use etc.) and ecosystem services (established for the Netherlands and EU).
8	ESII Tool (The Dow Chemical Company, The Nature Conservancy etc.)	2016	Ecosystem service valuation based on land use, which is easily applicable for companies' decision making by business practitioners using iPad
9	GaBi ts (GaBi & trucost)	2016	with **lifecycle analysis**, it valuate GHG, water and product environmental footprint
10	Land Use Change Improved (LUCI)-LCA (Natural Capital Project and Unilever)	2017	for **LCA** integrated spatially explicit modelling of land change and ecosystem services. Applying globally available, spatial data and accessible tools for ecosystem services to predictive modelling of large-scale changes in agricultural systems through LCA.
11	MiLCA (Japan Environmental Management Association for Industry)	2010	**a life cycle assessment (LCA)** support system. The default database supports users to quantify an amount of water and other abiotic resources use and emissions (e.g. CO2 and SOx).
12	Solvay Sustainable Portfolio Management (SPM) tool (Solvay, Arthur D.Little etc.)	2017	**LCA** based on 19 environmental indicators including climate change, human toxicity, ecotoxicity, water, land use. Tool for sustainable portfolio management using environmental impacts for each product

Results (3)

Evaluation on Comprehensiveness, Universality, Accessibility, Simplicity

		Comprehensiveness				Universality		Accessibility		Simplicity		Total score
		Quantitative	Value various ES	Corporate level	Supply chain	All Sectors	Geographic regions	Accessibility of tools	Needs for data	Technical skills	Time	
1	Biodiversity Footprint Tool	1	1	1	1	1	1	1	0	0	1	**7**
2	Business guide to natural capital valuation (PwC)	1	1	1	1	1	1	1	0	0	0	**6**
3	Co$tingNature	1	1	1	1	1	1	1	1	1	1	**9**
4	Corporate Environmental Profit and Loss account (EP&L)	1	1	1	1	1	1	1	0	0	0	**6**
5	Corporate Guidelines for the Economic Valuation of ES	1	1	1	1	1	1	1	0	1	0	**7**
6	Corporate Natural Capital Accounts	1	1	1	0	1	1	1	0	0	0	**5**
7	Environmental Prices	1	1	1	1	1	1	1	0	0	1	**7**
8	ESII Tool	1	1	0	1	1	1	1	0	1	1	**8**
9	GaBi ts	1	1	1	1	1	1	0	0	1	1	**7**
10	Land Use Change Improved (LUCI)-LCA	1	1	1	1	1	1	1	0	1	1	**8**
11	MiLCA	1	1	1	1	1	1	0	0	1	1	**7**
12	Solvay Sustainable Portfolio Management (SPM) tool	1	1	1	1	1	1	1	0	0	1	**7**

Results (4)

- Valuation methods/indicators for land use (1/3)

		Land use	Valuation methods	indicators				
				Area	Endanger spices	Vegetation	Condition of vegetation	others
1	Biodiversity Footprint Tool	1	Valuation based on land management type and area (using land use changes, intensification of land use, connectivity, climate change, infrastructures etc. based on GLC2000)	1	Considering changes of Mean Species Abundance of original species (MSA) in the areas (Based on (a)&(b))	(a) A changes of land surface (based on classes of Global Land Cover 2000)		(b)Intensiveness of land use (intensive vs. traditional agriculture, plantation vs. natural forest)
2	Business guide to natural capital valuation (PwC)	1	Ecosystem services provided by land (impact valuation depends on 1) business activities, 2) impact on services by business activities, weight depends on vulnerability of person using services)	1		Identification of Important ecosystem services in each eco-region (tropical forest, forest, grass lands desert etc.) developed by TEEB and monetary valuation		Differentiate new land development or utilization of developed areas
3	Co$tingNature	1	use detailed spatial, global datasets at 1 km2 resolution, valuation of ecosystem services, such as water supply, GHG, flood control, recreation, based on land use scenario	1	Impacts on IUCN Red data list, IBA, Global 200, KBA, Last of the Wild etc.	1	1	Useful for rough valuation in the area do not have detailed baseline data of ES
4	Corporate Environmental Profit and Loss account (EP&L)	1	Environmental impact assessment on ecosystem services throughout supply chain of stores, assembly, manufacturing, raw material processing, and raw material production <same as #2>	1		Identification of Important ecosystem services in each eco-region developed by TEEB and monetary valuation		Differentiate new land development or utilization of developed areas

Results (4)

- Valuation methods/indicators for land use (2/3)

		Land use	Valuation methods	indicators				
				Area	Endanger spices	Vegetation	Condition of vegetation	others
5	Corporate Guidelines for the Economic Valuation of Ecosystem Services	0	n/a Not based on land use, but Monetary valuation of 1) water supply, 2) bio-fuel supply, 3) water quality regulation, 4) climate regulation, 5) pollination, 6) soil erosion control, 7) recreation/tourism etc.					
6	Corporate Natural Capital Accounts	1	Natural Capital valuation of soil, endanger spices, fresh water, minerals etc. in the land managed by companies	1	Monetary valuation of willingness to pay related to recreation	1	1	Monetary valuation of ecosystem services and minerals
7	Environmental Prices	1	Land use area and type for one year, Weight depends on land use intensification, changes of spices abundance in the land, Price of land areas depends on geographic areas	1	Changes of spices abundance in the land	Land type	Weight depends on intensification of land use	Price of land areas depends on geographic areas
8	ESII Tool (The Dow Chemical Company, TNC etc.)	1	Land area, type (agriculture, not developed, land use, surface water), vegetation, condition of surface area, landscape, watershed, scenery, rainfall etc.)	1		1	1	Considering land type (agriculture, land use, surface water), condition of surface area, landscape, watershed, scenery, rainfall etc.

Results (4)

- Valuation methods/indicators for land use (3/3)

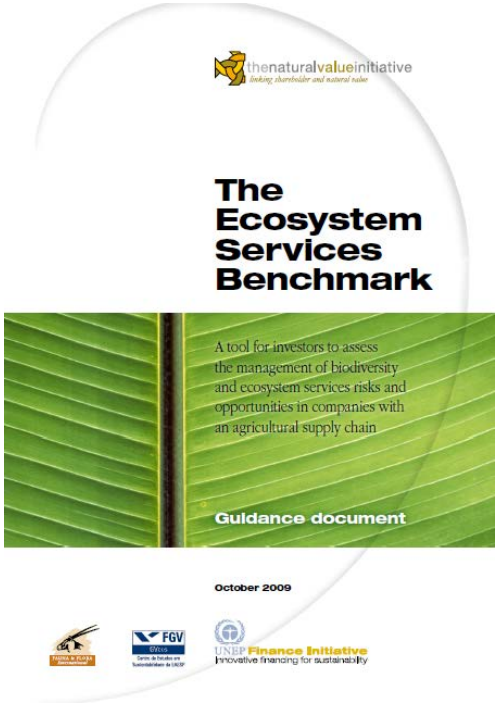
		Land use	Valuation methods	Indicators				
				Area	Endanger spices	Vegetation	Condition of vegetation	others
9	GaBi ts	1	with **lifecycle analysis**, it valuate GHG, water and product environmental footprint	1				
10	Land Use Change Improved (LUCI)-LCA	1	Using both by LCA and InVest, integrating impact valuation of ecosystem such as GHG emission, soil erosion, water consumption, loss of biodiversity triggered by land use changes	1	1 Considering changes of Mean Species Abundance of original species (MSA) in the areas	1	1	predicting changes of ecosystem by land use changes and production option of agriculture
11	MiLCA (Japan Environmental Management Association for Industry)	0	n/a life cycle assessment (LCA). The default database supports users to quantify an amount of water and other abiotic resources use and emissions					
12	Solvay Sustainable Portfolio Management (SPM) tool	1	Land area necessary to produce 1kg of products x year of using the land (Apply CML 2007 method)	1				Monetary valuation of land use impacts on ecosystem services including flood control, recreation, food and energy supply, climate regulation etc. (utilizing shadow price in CML 2000)

Corporate BES valuation benchmark for financial institutions (ref.)

The Ecosystem Services Benchmark (UNEP-FI, FFI, FGV 2009)

Scored in four level in five category (more detailed questions for each category)

	Category	Detailed questions	weight
1	Competitive advantage	1) Value Creation, 2) Ensuring sustainability of supply	15%
2	Governance	1) Responsibility, 2) Risk assessment –nature of products, 3) Risk assessment-nature of supply base, 4) Stakeholder engagement	20%
3	Policy & Strategy	1) Policy and strategy framework, 2) Standards setting	20%
4	Management & Implementation	1) Supplier and grower engagement, 2) Capacity building, 3) Assurance, 4) Coverage – breadth of implementation, 5) Coverage – depth of implementation	25%
5	Reporting	1) Farm level data collection/ supply chain monitoring, 2) Quantitative targets, 3) Reporting, 4)Public affairs and lobbying	20%



Summary of analysis

- Many existing tools (32 or 82%) find **land use changes as an important indicators of BES valuation**. Land used changes were also identified as key factors of biodiversity loss in academic literatures (Alkemade et al. 2009, Millennium Ecosystem Assessment 2005, Pereira et al. 2012, Sala et al. 2000).
- For **valuation for specific project areas**, it is possible to apply ecosystem services valuation **utilizing GIS data**
- For corporate and products level of **Life Cycle Assessment**, many tools **rely on area of land use** for valuation
- **In Europe**, there are **some list of potential price for monetary valuation** depends on habitat types and environmental impacts such as GHG emission, land and water use, human toxicity, ecotoxicity, acidification, eutrophication, ozone depletion etc. (CML 2007, CML 2000, CE Delft 2017, eftec 2015)

Discussion

- **BES valuation tools** are designed to be used **as a part of whole process of better decision making for conservation of BES** including: 1) clarification of purpose of valuation, 2) screening, 3) scoping, 4) valuation, 5) application for decision making, 6) development of action plans.
- **Valuation methods** (market price, restoration cost, mitigation cost, opportunity cost, willingness to pay, social cost etc.) are various and **should be selected depends on purpose and strategies of companies**, and BES valuation is not always used for comparison with other companies

Way forward

- Corporate level of BES valuation based on LCA **need to incorporate more comprehensive land based assessment of BES**
- Companies need to select a tool not only for one time valuation, but also **valuation to predict or evaluate changes of BES** and to analyze BES based on scenario modeling **depend on actions that company will take** (=potential use BES valuation for strategy development for companies)
- To compare BES valuation among different companies, it is **necessary to standardize a method of BES valuation** such as utilizing SEEA EEA.

Thank you !

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